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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/537,200	06/02/2005	Koichi Shimizu	1433(05-28)	1875
30030	7590	06/07/2007	EXAMINER	
JAMES R. WILLIAMS 3103 WILMINGTON ROAD NEW CASTLE, PA 16105			LANGMAN, JONATHAN C	
			ART UNIT	PAPER NUMBER
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/537,200	Applicant(s) SHIMIZU ET AL.	
	Examiner Jonathan C. Langman	Art Unit 1775	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
 - If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
 - Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 02 June 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-9 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-9 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 02 June 2005 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|-----------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date <u>06/02/2005</u> | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Objections

Claim 1 is objected to because of the following informalities: after "Z" in line 6 there is an unnecessary ":". Appropriate correction is required.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claim 1 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 1 recites the limitation "the interior wall" in line 3. There is insufficient antecedent basis for this limitation in the claim.

Claim 1 recites the limitation "the silicon holding vessel" in line 3. There is insufficient antecedent basis for this limitation in the claim. There is antecedent basis for a silicon vessel, however there is no antecedent basis for the term "holding".

Claim 3 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. In claim 3 the applicant states that "the silicon oxide is" in lines 1-2. It is unclear as to whether this silicon oxide is the silicon oxide making up a part of the coating or if this is the silicon oxide used to make up the vessel. Since it is unclear as to what part of the structure this claim is limiting, it makes the claim

indefinite. Clarification is needed. For examination purposes The Examiner interprets "the silicon oxide " as referring to the vessel.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hide et al., "Mould shaping silicon crystal growth with a mould coating material by the spinning method" J. Crystal Growth in view of Woditsch et al. (U.S. 4,755,220).

Regarding claims 1 and 2, Hide et al. teach a coating that acts as a release agent. The coating lines a crucible for holding silicon and is made up of silicon nitride mixed with silicon dioxide (Hide et al., pg. 585, col. 1). Hide et al. goes on to teach that the ratio of silicon oxide and silicon nitride may be adjusted for desirable results (Hide et al., pg. 585, col. 2). However, Hide et al. is silent to the exact ratio of the mixture and furthermore does not suggest elemental silicon is a part of the mixture.

Woditsch et al. teach a crucible made up of a composite of silicon nitride, silicon oxide, elemental silicon, and silicon oxynitride (Woditsch et al., col. 2, lines 16-20). The specific ratios for **metal silicon (X): silicon nitride (Y): silicon oxide (Z): silicon oxynitride (Q)** are **X:Y:Z:Q = 2-20: 40-90: 2-20: 2-20** (Woditsch et al., col. 2, lines 50-55) (emphasis added). These ranges overlap with the instantly claimed ranges, and the

claim language of the instant claim is open ended due to the word "comprising" therefore this specific composition reads on the applicants instantly claimed invention even with the addition of silicon oxynitride. Woditsch et al. and the claims differ in that Woditsch et al. does not teach the exact same proportions as recited in the instant claims. However, one of ordinary skill in the art at the time the invention was made would have considered the invention to have been obvious because the compositional proportions taught by Woditsch et al. overlap the instantly claimed proportions and therefore are considered to establish a prima facie case of obviousness. It would have been obvious to one of ordinary skill in the art to select any portion of the disclosed ranges including the instantly claimed ranges from the ranges disclosed in the prior art reference, particularly in view of the fact that;

"The normal desire of scientists or artisans to improve upon what is already generally known provides the motivation to determine where in a disclosed set of percentage ranges is the optimum combination of percentages", In re Peterson 65 USPQ2d 1379 (CAFC 2003).

Also, In re Geisler 43 USPQ2d 1365 (Fed. Cir. 1997); In re Woodruff, 16 USPQ2d 1934 (CCPA 1976); In re Malagari, 182 USPQ 549, 553 (CCPA 1974) and MPEP 2144.05.

Woditsch et al. teach that the novel composite material makes up the crucible instead of teaching the composition as a coating on a crucible. However the material of Woditsch et al. is used and shows great results as a material for dewetting the surface of an inner wall of a crucible. The silicon melt is unable to cling on to the walls of the crucible due to the novel composition.

Hide et al. instead of teaching the entire crucible made up of this dewetting composition, teach, for economical purposes, that only lining a crucible will suffice and

Art Unit: 1775

therefore less amounts of the novel composition are is needed. Hide et al. teach compositions of similar materials to those taught by Woditsch et al can be used as liners for crucibles. It would have been obvious to a person having ordinary skill in the art at the time the present invention was made to use the novel composition of Woditsch et al. as a liner for a crucible as taught by Hide et al., because the materials have been shown to be functional equivalents and furthermore, as stated above for economical reasons.

Regarding claims 3, 4, and 7-9, Hide et al. and Woditsch et al. teach coating a crucible with a composition as described above. The crucible as taught by Hide et al. is made up of Graphite (Hide et al., pg. 588, col. 2). However it would have been obvious to a person having ordinary skill in the art at the time the present invention was made to make the mould of any known material in the art for silicon processing, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious engineering choice. (*In re Leshin*, 125, USPQ 416).

Regarding claims 5 and 10, Hide et al. teach that the coating is around 200 microns thick (Hide et al., Figure 1). This falls within both of the given ranges in the instant claims. It would have been obvious to a person having ordinary skill in the art at the time the present invention was made to choose a thickness large enough to provide optimal protection to the outer crucible, and to provide good dewetting properties to the crucible. It would have been obvious to one having ordinary skill in the art at the time of the invention to adjust the thickness of the coating for the intended application, since it

has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

Regarding claim 6, Hide et al. and Woditsch et al. teach a coating for a crucible as described above. They do not teach in combination the exact same process limitations as set out in the instant claim. Barring any unexpected results, it would have been obvious to a person having ordinary skill in the art at the time the present invention was made to use any commonly well known coating technique, including spraying.

In further regards to claims 1 and 6, Hide et al. and Woditsch et al. teach a coating for a crucible used in silicon melting, as described above.

Regarding the amount of silicon oxide used in the composition of Woditsch et al., they teach, "It is known that silicon dioxide reacts with liquid silicon to form volatile silicon monoxide. On the other hand silicon dioxide is poorly wetted by a silicon melt whereas silicon nitride is wetted relatively well" (Woditsch et al., col. 2, lines 40-45). It would have been obvious to a person having ordinary skill in the art at the time the present invention was made, barring unexpected results, to optimize the ratio of silicon oxide in the composition: enough to make sure proper dewetting occurred and not too much to cause degradation of the layer to silicon monoxide. Since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

Regarding the amount of elemental silicon in the material, Woditsch et al. teach, "If the material is to be used at temperatures below 1400°C it can be useful for

Art Unit: 1775

economic reasons to produce (the composition) having a high content of free elemental silicon by applying short nitriding times" (Woditsch et al., col. 5, lines 48-55). It would have been obvious to a person having ordinary skill in the art at the time the present invention was made to optimize the amount of silicon metal used in the composition in order to achieve a more cost effective composition, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jonathan C. Langman whose telephone number is 571-272-4811. The examiner can normally be reached on Mon-Fri 9:00 am - 4:30 pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jennifer McNeil can be reached on 571-272-1540. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.



JCL



JENNIFER C. MCNEIL
SUPERVISORY PATENT EXAMINER

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